Indoor Air Quality Student Project

This is an exciting opportunity for students to become involved in improving their school's indoor environment, specifically the school's indoor air quality. U.S. EPA Region 9's Indoor Environment Team will provide mentors for a student or group of students in the San Francisco Bay Area who wish to improve their school's indoor air quality by establishing the EPA Indoor Air Quality Tools for Schools Program at their school. Note: If you are outside the Bay Area, we may be able to provide a mentor through partner organizations, or coach you via phone and e-mail.

Students would learn about the indoor environment (ecology); indoor air quality (pollution); the effect of building materials, furnishings, building occupants and their activities on indoor air quality; ventilation systems and building structure (engineering and architecture); mold (microbiology); charting temperature, CO2 and humidity levels; public speaking and preparing presentation materials and reports. There is the potential to work with scientists from other agencies as well.

<u>This would require the following at a minimum:</u>

- 1-2 hour training for one or more students and a teacher who would serve as a mentor (it would be helpful to have a district maintenance person, school nurse and custodian at the training),
- 15 minute presentation by the student (with EPA assistance) at a staff meeting,
- a similar presentation (with EPA assistance) to the school's PTA or parent organization, time required to photocopy and distribute activity checklists to school staff (15 minutes),
- collection of checklists and plotting results on a floor plan of the school with EPA assistance (1-hour),
- EPA-lead walk-through of the school (2-3hours). Walk-through would benefit by having facilities staff, nursing staff, custodial staff present: ½ hour coordinating schedules,
- walk-through report write-up (2-hours with EPA guidance) which would include recommendations and prioritized list of findings,
- presentation of findings to school staff (with EPA assistance): 2-3 hours creating presentation, 15 minutes actual presentation,
- similar presentation to school board, 15 minutes,
- prepare "hand-off" guidance for another student to take up next year, i.e. lessons learned: 2-hours

<u>Optional:</u>

- arrange for booth at Earth Day Fair
- take mold samples
- perform measurements of temperature, humidity, CO2 and prepare charts
- photographic or video documentary
- mentor other schools
- work with other agencies

- experiments regarding CO2 (or other pollutant) accumulation
- other suggestions?

Match-up with California educational standards:

The numbers refer to the CA State Content Standards that can be found at the CDE website: www.cde.ca.gov/standards.

CONTENT STANDARDS

- Grade 6: Earth Science
  - #3 (all); #6b; #7a,b,d,e,h
- Grade 7: Life Science
  - #7a,b,d,e
- Grade 8: Physical Science
  - #3b,d;
- Grades 9-12:
  Earth Science - #7a; 8c
  Biology - #6a,b,d; 10a,e
  Chemistry - #4b
  Investigation and Experimentation - #1a,d,i,l,m

There are also likely some standards from the areas of Social Studies and Language Arts.

Student-led IAQ Management Plan

Introduction

The XXXXX High School Indoor Air Quality (IAQ) Program is based on the Environmental Protection Agency's Indoor Air Quality Tools for Schools Program. At our high school the Indoor Air Coordinator is a student rather than a teacher or other staff.

The Indoor Environment is as interesting and complex as the ocean, mountain, desert, i.e. outdoor environments, and as we spend 90% of our days within a "built" environment, it is our immediate environment. Hence, it is within the purview of the Environmental Club to adopt the Tools for Schools Program as a student project. Implementation of the Tools for Schools Program will assure the best environmental conditions for teaching and learning while contributing to the fulfillment of our academic goals as well.

The Student-led IAQ Management Plan will layout a systematic process for:

- evaluating the occupant activities and building characteristics that contribute to good or poor IAQ;
- coordinating with district staff;
- educating school occupants about the importance of good IAQ, how we all contribute to good or poor IAQ, and how our building's structural and mechanicals systems are designed to control indoor environmental conditions;
- communicating with the faculty, staff, student body, school district and school administration, and parent community.

Roles & Responsibilities

Faculty Advisor

- learn about the program
- mentor students or coordinate with EPA or other mentors
- introduce student leaders to faculty and district staff and administration
- provide continuity as students move through the program
- monitor long term district activities that affect indoor air quality
- reach out to public health agencies, science & engineering entities, financial & administrative entities, that can enhance the academic experience
- establish a file for materials, checklists, repair reports.

Student Leaders

- learn about the program
- give presentations to students, staff, faculty, etc.
- copy, distribute, collect and analyze checklists and other materials
- coordinate and "lead" indoor air quality school "walk-throughs"
- create a results report
- present the results to students, staff, faculty, etc.
- track corrective actions

- provide “hand-off” materials for students for the next school term.

Required Annual Activities

1. Brief Staff

   Give a brief presentation to teachers staff meeting - invite other staff members - describing importance of indoor air quality and explaining the program.

2. Distribute Checklists

   The Tools for Schools “Kit” contains checklists tailored for teachers, custodians, office staff, etc. Distribute these checklists along with the IAQ Backgrounder and a cover letter. Set a date by which they should be returned.

3. Collect & Analyze Checklists

   Review the completed checklists and plot responses on a floorplan of the school. Determine if any obvious pattern of responses emerges.

4. Conduct a Walk-through

   Arrange to conduct a school IAQ walk-through. Coordinate with school district staff to assist with the walk-through. A ventilation engineer or technician must accompany the walk-through. A school custodian should also be present. A school nurse or district health official would add value. Take notes. Photographs and/or videos would be a bonus. Remember that a “walk-through” includes the outside of the school, looking for sources of contaminants that might enter the school, from pollen to pesticides and nearby industry.

5. Create a report and presentation from the walk-through. Present this to staff, administration, PTA, etc.

5. Track corrective actions by district and school occupants.

5. Create “hand-off” materials for students taking on the project next year.

Additional / Optional Activities

Specific Indoor Pollutants / Contaminants

Radon and lead are specific pollutants for which simple tests can be performed. Asbestos is also a significant hazard, but your district should have an asbestos program and can tell you what has been done about it.

Policies

It may be useful for your school or district to adopt policies regarding indoor air quality practices in general or more specific policies, such as:

- pets in the classroom - whether to have them or how they’re to be maintained;
- use of integrated pest management (IPM) techniques;
- floor coverings: should carpeting be used or where should it be used;

- use of scented personal care products;
- art and science supplies;
- bringing in cleaners from home;
- etc.

You might initiate discussions with the student body, staff and administration on whether such policies might be beneficial.

Mold

Learn about the many species of mold (fungi), those that may grow inside and outside and the benefits and hazards from this important group of organisms. Learn about the many kinds of tests for indoor mold and the pros and cons of each. Consider trying to culture mold on different building materials. Learn about measures for preventing and for remediating mold growth in buildings.

Building Construction Techniques

Learn about the history of construction and the impacts to health from different techniques. Are indoor air quality problems worse now than in the past? Is indoor mold worse now? Learn about the history of ventilation standards and the social and medical issues that have influenced these standards. Learn about the different styles of architecture such as the "open floorplan" and how it has affected the learning environment. Learn about the Collaborative for High Performance Schools (CHPS) initiative (http://www.chps.net). Learn about "green" building practices and the "cradle to grave" approach.

Building Ventilation

Ventilation systems are the "lungs" of a building, important, complex and interesting. Learn about the different types of ventilation systems, the pros and cons of each and emerging trends.

Portable Classrooms / Modular Construction

Learn about these approaches to providing classroom space. Consider a field trip to manufacturers of portable classrooms. Read and summarize the California Air Resources Board's and the California Department of Health's research report on Portable Classrooms.

District Resources

Learn about your school district's budget and determine the number of custodial and maintenance staff employed. Determine if this number matches guidance on staffing levels as prescribed by the California Association of School Business Officials (CASBO). Interview facilities managers to learn about what work can and cannot be done given their staffing levels. Who has responsibility for environmental and health and safety issues? Learn about the district's energy costs, number of school nurses, etc.

Measurements of IAQ Parameters

Perform measurements and analysis of CO2, CO, temperature and relative humidity. How do these change during the day?

Earthday

Prepare a display for Earthday.

Mentoring

Mentor another school, elementary, middle or high school. Help establish Tools for Schools, either by staff or student implementation.

Asthma

Research the asthma issue: theories on why it's increasing, the role of asthma triggers in the environment, economic and educational impacts, numbers of hospitalizations and deaths, prevalence among various ethnic groups, socioeconomic factors, etc.

Sick Building Syndrome / Building Related Illnesses / Legionnaires disease

Research these emerging phenomena.

Multiple Chemical Sensitivity

Research this medical condition. Is it real? What is its relation to Sick Building Syndrome?

Documentary

Create a photographic or video documentary.

Posters, Comic Books, Advertising

Develop an awareness campaign for school occupants.

10 Minute Student Presentation

- Hi. My name is XXXX. As a project for the Environmental Club, we're working with Shelly Rosenblum of the U.S. Environmental Protection Agency, on Indoor Air Quality (IAQ), at our school. We're following EPA's program, the IAQ Tools for Schools Kit. (Have the Kit with you.)

- In the past we knew that air pollution outside was important. Now, the EPA and the California Air Resources Board and California Department of Health Services know that pollution indoors is also very important, AND we spend about 90% of our lives indoors!
    - Indoor air pollution may cause or exacerbate respiratory problems, eye irritation, asthma, headaches, fatigue and a variety of other problems that may be called sick building syndrome.

- With the exception of automobile and some factory emissions, pollution indoors can be many times higher than outdoors.

- Schools are special indoor environments:
    - more densely crowded than homes or offices
    - there are more sources of indoor pollution,
    - tight budgets result in less than optimal custodial and maintenance services, resulting in dust and poor air circulation.

    There are two sides to the indoor air "coin:"
    - Things that the district staff are responsible for such as the building structure and mechanical systems, and
    - Things that people do inside buildings.

- The EPA Tools for Schools Program addresses both of these. As part of our student project, we will focus on the role of the school occupants, but also work with the district to understand the mechanical systems and maintenance part.

- As a first step, we're asking the teachers to fill out a short checklist to see how classroom conditions and typical activities may be affecting air quality.

- We'll collect the checklists and plot the results on a floor plan to see if there are any specific problem areas, and then do a walk-through and record observations. Mr. Rosenblum will be assisting us with all this.

- Then we'll see if we can make recommendations for activities that can improve the air quality inside the school. The EPA has found that simple changes can often improve air quality significantly.

- At the end of the project, we'll report back to all of you and write a report for the district.

Some other things we're considering include:

- Presentation to the school board or PTA
- Display for Earthday
- Mentoring elementary and middle schools
- Speaking with students at other high schools

Indoor Air Quality Tools for Schools Walk-through Report

Author:

Date of Walk-through:

School:

Attendees:

Introduction

A "walk-through" is simply an instructional tour of the school, the purpose of which is to help educate school staff to the kinds of features that contribute to good or poor indoor air quality (IAQ). Examples of such features are ventilation systems and components such as filters and air vents, ground drainage, location of dumpsters and idling vehicles, as well as the dynamics of behavior and timing of activities such as cleaning, painting, construction, and classroom activities. A walk-through is not an inspection nor is it a thorough evaluation of the buildings or the buildings' support systems.

We use the U.S. Environmental Protection Agency's IAQ Tools for Schools Program's Walk-through Checklist to guide us. On some walk-throughs an instrument to measure carbon dioxide (CO_2), carbon monoxide (CO), temperature and relative humidity is used. These measurements demonstrate for educational purposes what our senses are already telling us, i.e. that rooms may be hot, humid and stuffy and by providing concentration levels allows the comparison of one area with another. CO is a product of combustion and may be found near heaters which burn natural gas, or may come from automobile emissions near the school. CO_2 is a product of respiration and can provide an indication of the outside air exchange. The American Society of Heating, Refrigeration & Air Conditioning Engineers (ASHRAE) recommends that when designing ventilation systems, outside air should be provided constantly at a rate of 15 cubic feet per minute (cfm) per person for typical school or office situations. CO_2 levels of 1000 parts per million (ppm) and below generally indicate that this outside air exchange is occurring. When rooms have no mechanical ventilation systems, or the systems do not provide outside air, it is common to find CO_2 levels above 1000 ppm. While not toxic, as CO_2 levels rise, rooms become "stuffy" and occupants may feel drowsy. Additionally, if CO_2 levels are increasing, then so are levels of chemicals off-gassing from building materials, teaching supplies, personal care products, furnishings, etc.

ADDITIONAL MATERIAL RELEVANT TO THIS WALK-THROUGH

- Student population
- Age of school
- Dates of remodels or new construction
- Noteworthy architectural features
- Noteworthy mechanical of HVAC aspects
- ??

Observations By Room or Area

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Discussion

Priority Scheme

As with all schools, we found places where both district attention and awareness of good IAQ practices as well as good communication between district staff and school occupants can make significant improvements to the indoor environment.

Priority List

We use a simple scheme for prioritizing indoor air quality walk-through findings:

Priority Category 1 - items which are of immediate concern for safety or health and/or items which can be fixed immediately with little or no money or resources.

Priority Category 2 - items which should be addressed but which would require some time and money.

Priority Category 3 - Wish List

We have taken the liberty of placing findings from the walk-through in the categories described above. However, without a full understanding of the District's resources or the work required, we may have underestimated the resources required to address any particular finding. Suggestions for correcting certain situations are indeed merely suggestions. ***The point is to look at various conditions and be inventive***, especially where the proper fix is simply too expensive or difficult for immediate resolution ***but for which a common sense approach may provide relief***.

Findings and Priorities

School Name			
Row #	**Priority Level**	**School Responsibility**	**District Responsibility**
1			
2			